Conceptual Model

Characterization of Ambient PFAS in the Chattooga River Watershed

EPA R4 LSASD Project Lead:

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Proposed Study Dates:

Recon: Week of October 7th, 2019 Study: Week of November 4th, 2019

Goal:

Characterize the distribution and mass loading of PFAS in the Chattooga River Watershed at near-base flow conditions along key segments determined by Region 4 Water Division.

Study Objectives:

1. Collect surface water samples coupled with discharge measurements to compute instantaneous mass loading rates of PFAS along key segments of the Chattooga River Watershed.

2. Collect sediment samples collocated with surface water sample locations to determine the relative distribution and potential migration of PFAS contaminated sediments to the receiving waters of Weiss Lake.

Study Area:

The study area for this project includes the main stem of the Chattooga River and several inflowing tributaries. Proposed sampling locations range from the lower Chattooga River near Gaylesville AL where the river terminates into Weiss Lake, to the headwaters of the Chattooga River north of LaFayette GA. A total of 13 sites will be assessed which includes 8 stations on the main stem of the Chattooga River, 1 station on Town Creek which forms the headwaters of the Chattooga River, 3 tributary stations in watersheds with active biosolids application sites, and 1 station on Mill Creek in Alabama. See Table 1 for a description of all proposed sampling sites. *Proposed sampling locations were informed by a reconnaissance conducted during the week of October 7th, 2019 to assess site conditions and accessibility under base flow conditions.*

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Study Design:

In-Situ Water Quality

Surface water quality measurements of temperature, dissolved oxygen, specific conductance, turbidity, and pH will be collected *in-situ* via multi-parameter data sondes at each site. See Table 2 for a detailed list of *in-situ* water quality parameters.

PFAS Loading Rates (Surface Water Sampling and Discharge Measurements)

Surface water samples will be collected at each site and transported to the EPA R4 Laboratory at LSASD in Athens GA to be analyzed for the 23 PFAS analytes listed in Table 3. A corresponding discharge will be either directly measured via handheld or remotely-operated flowmeters or retrieved from USGS gaging stations for each sampling location to compute a mass loading rate of detected PFAS compounds. This study will target base flow conditions. Approximate base flow conditions will be defined as a discharge below the monthly mean for November as recorded by historical streamflow data collected at the USGS gage located on the lower Chattooga River (USGS 02398300) over a 30-year period. The threshold value is 450 ft^3/s. A discharge above this threshold will be considered non-base flow conditions and the sampling event will be postponed until water levels recede to appropriate levels.

Sediment Sampling

Sediment samples will be collected at each site and transported to the EPA R4 Laboratory at LSASD in Athens GA to be analyzed for the 23 PFAS analytes listed in Table 3. Each sediment sample will consist of a composite of 3 sediment aliquots collected across a transect perpendicular to the stream flow to account for streambed heterogeneity.

Quality Control Samples

Multiple control samples will be collected in accordance with LSASD Standard Operating Procedures and accepted trace-level contaminant sampling practices. Control samples will include trip blanks, field blanks, field equipment rinse blanks, field duplicate samples, and matrix spike/matrix spike duplicate field samples. Surface water and sediment samples collected for PFAS analysis will be sampled via a trace level sampling technique to avoid cross-contamination of PFAS samples due to sample collection and handling. This process will require two field personnel for PFAS sample collection. A designated sampler will handle the sample media and sample container only. A second designee will operate sampling equipment and assist with sample container packaging and labeling.

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Project Timeline:

The proposed field activities for this study are planned for the week of November 4th, 2019. Laboratory turn-around time is 35 days from the time samples are received. The draft final report for this study is expected to be provided to the Water Division on January 22th, 2020.

Expected Project Outcomes:

1. Relative mass loadings of PFAS compounds in surface water along key segments of the Chattooga River Watershed.

2. Insight into the relative distribution and potential migration of PFAS compounds in sediments to the receiving waters of Weiss Lake.

3. Comparison of PFAS concentrations and compositions in sediment and surface water along key segments of the Chattooga River Watershed.

Table 1: Proposed Sampling Site Locations

Station ID	Water Body	Approximate Coordinates (DD.ddddd)		Site Description
		Latitude	Longitude	
CHR01	Chattooga River	34.26362	-85.56017	Chattooga River at Hwy 35 in Gaylesville AL
MIC01	Mill Creek	34.29581	-85.50949	Mill Creek at Hwy 68 near Gaylesville AL
CHR02	Chattooga River	34.33585	-85.44564	Chattooga River at Rte 323 in Chattoogaville GA
HIC01	Hinton Creek	34.33456	-85.43668	Hinton Creek at Rte 323 in Chattoogaville GA
CHR03	Chattooga River	34.40220	-85.39595	Chattooga River at Lyerly Dam Rd in Lyerly GA
CHR04	Chattooga River	34.44476	-85.36263	Chattooga River at Hwy 100 near Summerville GA
RAC01	Raccoon Creek	Redacted	Redacted	Raccoon Creek upstream of Summerville public drinking water intake facility GA
CHR05	Chattooga River	34.51955	-85.30120	Chattooga River at Penn Bridge Rd near Trion GA
CHR06	Chattooga River	34.54532	-85.31792	Chattooga River upstream of low-head dam near Trion GA
TEC01	Teloga Creek	34.54353	-85.38531	Teloga Creek at Hwy 327 in Broomtown Valley GA
CHR07	Chattooga River	34.66671	-85.30005	Chattooga River at Foster Mill Dr near LaFayette GA
CHR08	Chattooga River	34.70723	-85.28696	Chattooga River near Culberson Ave in LaFayette GA
TOC01	Town Creek	34.71414	-85.26769	Town Creek at Round Pond Rd near LaFayette GA

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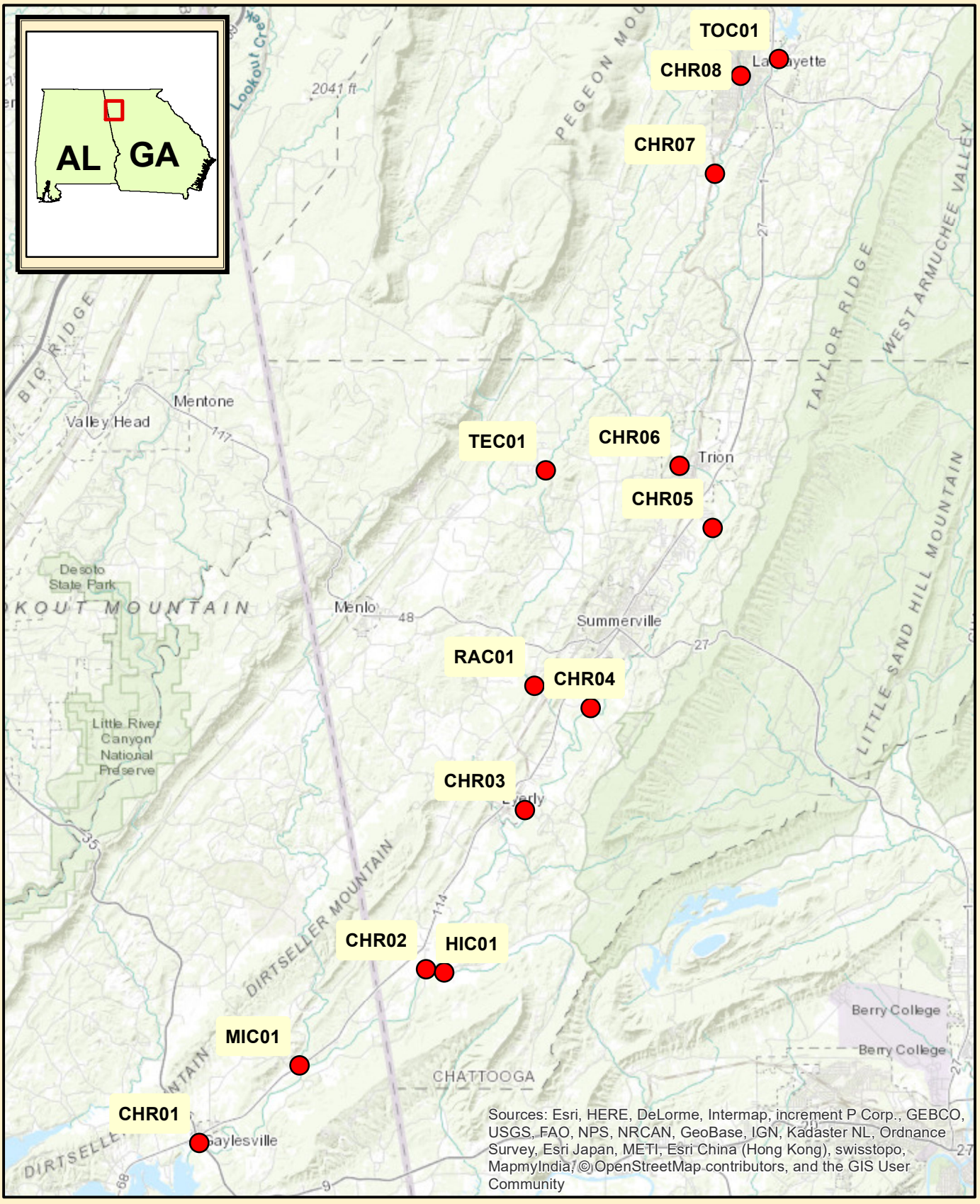
Table 2: *In-Situ* Water Quality Parameters

***In-Situ* Water Quality Parameter Measurement Uncertainty**			
Parameter	**Units**	**Measurement Technology**	**Equipment Sensitivity**
pH	SU	Glass electrode	± 0.2 SU
Dissolved Oxygen	mg/L	Luminescent DO probe	± 0.2 mg/L
Temperature	°C	LDO Thermistor	± 0.2 °C
Specific Conductance	µmho	Nickel electrode cell	± 0.5% of reading
Turbidity	FNU	Optical Probe	± 5% of reading

Table 3: PFAS Target Analyte List

Region IV Laboratory Per - and Polyfluoroalkyl Substances (PFAS) Target Analyte List Minimum Reporting Limits (MRLs)				
Analyte	**Water µg/L (ppb)**		**Soil/Sediment µg/kg (ppb)**	
	MDL	**MRL**	**MDL**	**MRL**
Perfluorotridecanoic acid (PFTrDA)	0.039	0.040	0.040	0.100
Perfluorododecanoic acid (PFDoA)	0.029	0.040	0.040	0.100
Perfluoroundecanoic acid (PFUDA)	0.021	0.040	0.040	0.100
Perfluorodecanoic acid (PFDA)	0.096	0.160	0.040	0.100
Perfluorononanoic acid (PFNA)	0.016	0.040	0.040	0.100
Perfluorooctanoic acid (PFOA)	0.026	0.040	0.040	0.100
Perfluoroheptanoic acid (PFHpA)	0.014	0.040	0.040	0.100
Perfluorohexanoic acid (PFHxA)	0.031	0.040	0.040	0.100
Perfluoropentanoic acid (PFPeA)	0.018	0.040	0.040	0.100
Perfluorobutyric acid (PFBA)	0.022	0.040	0.040	0.100
Perfluorodecanesulfonate (PFDS)	0.032	0.039	0.040	0.096
Perfluorononanesulfonate (PFNS)	0.015	0.038	0.040	0.096
Perfluorooctanesulfonate (PFOS)	0.017	0.037	0.040	0.092
Perfluoroheptanesulfonate (PFHpS)	0.017	0.038	0.040	0.095
Perfluorohexanesulfonate (PFHxS)	0.017	0.036	0.040	0.091
Perfluoropentanesulfonate (PFPeS)	0.013	0.038	0.040	0.094
Perfluorobutanesulfonate (PFBS)	0.023	0.035	0.040	0.088
Perfluorooctanesulfonamide (FOSA)	0.031	0.040	0.040	0.100
Fluorotelomer sulfonate 8:02 (8:2 FTS)	0.034	0.038	0.040	0.096
Fluorotelomer sulfonate 6:02 (6:2 FTS)	0.029	0.038	0.040	0.095
Fluorotelomer sulfonate 4:02 (4:2 FTS)	0.021	0.037	0.040	0.094
N-(Heptadecafluorooctylsulfonyl)-N-methylglycine (N-MeFOSAA)	0.110	0.160	0.040	0.100
Hexafluoropropylene oxide–dimer acid (HFPO-DA)	0.026	0.040	0.040	0.100

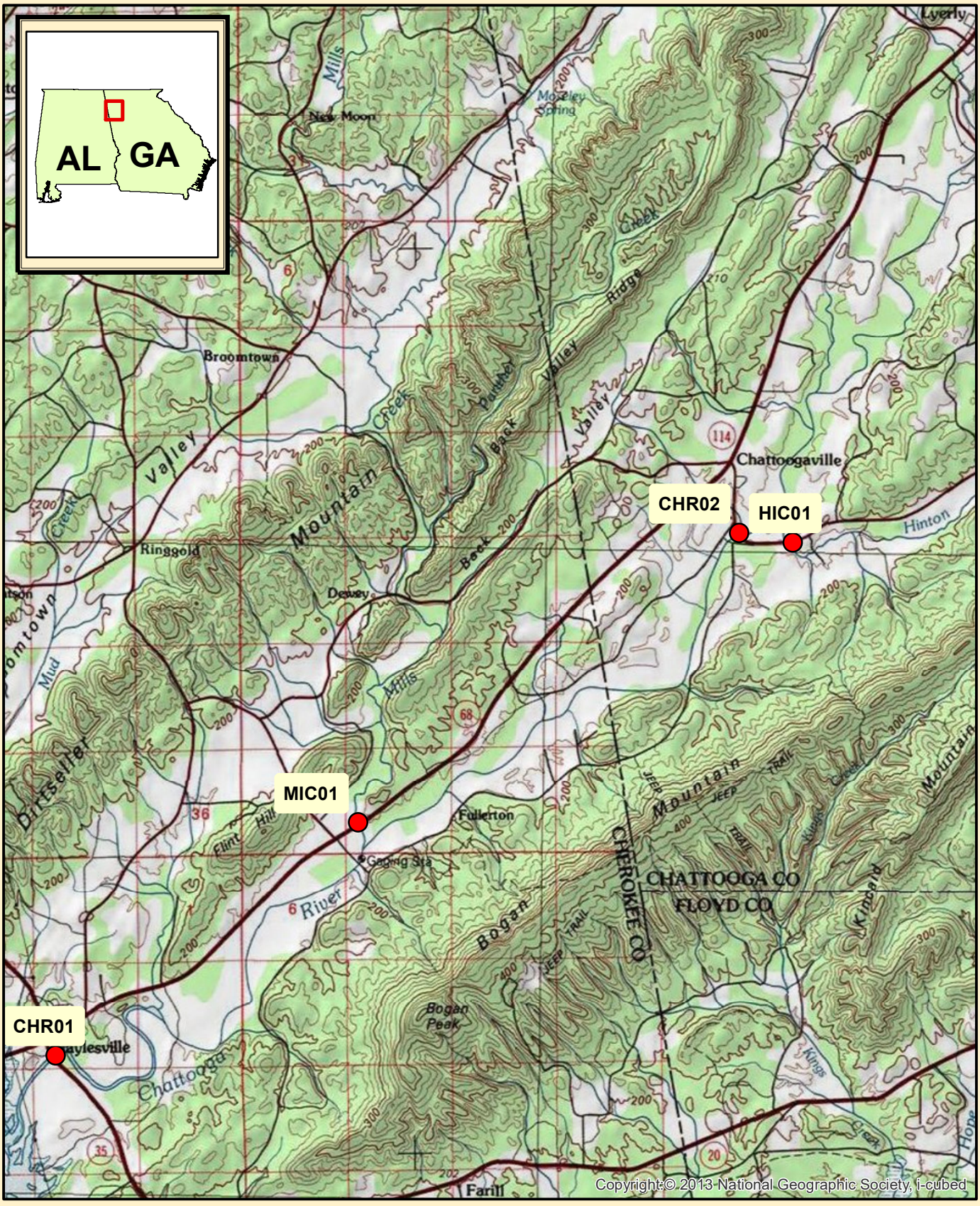


PFAS Screening:
Chattooga River (Base-flow)

Proposed Sampling Sites, November 2019

0 1.75 3.5 7
Miles

Sampling Locations

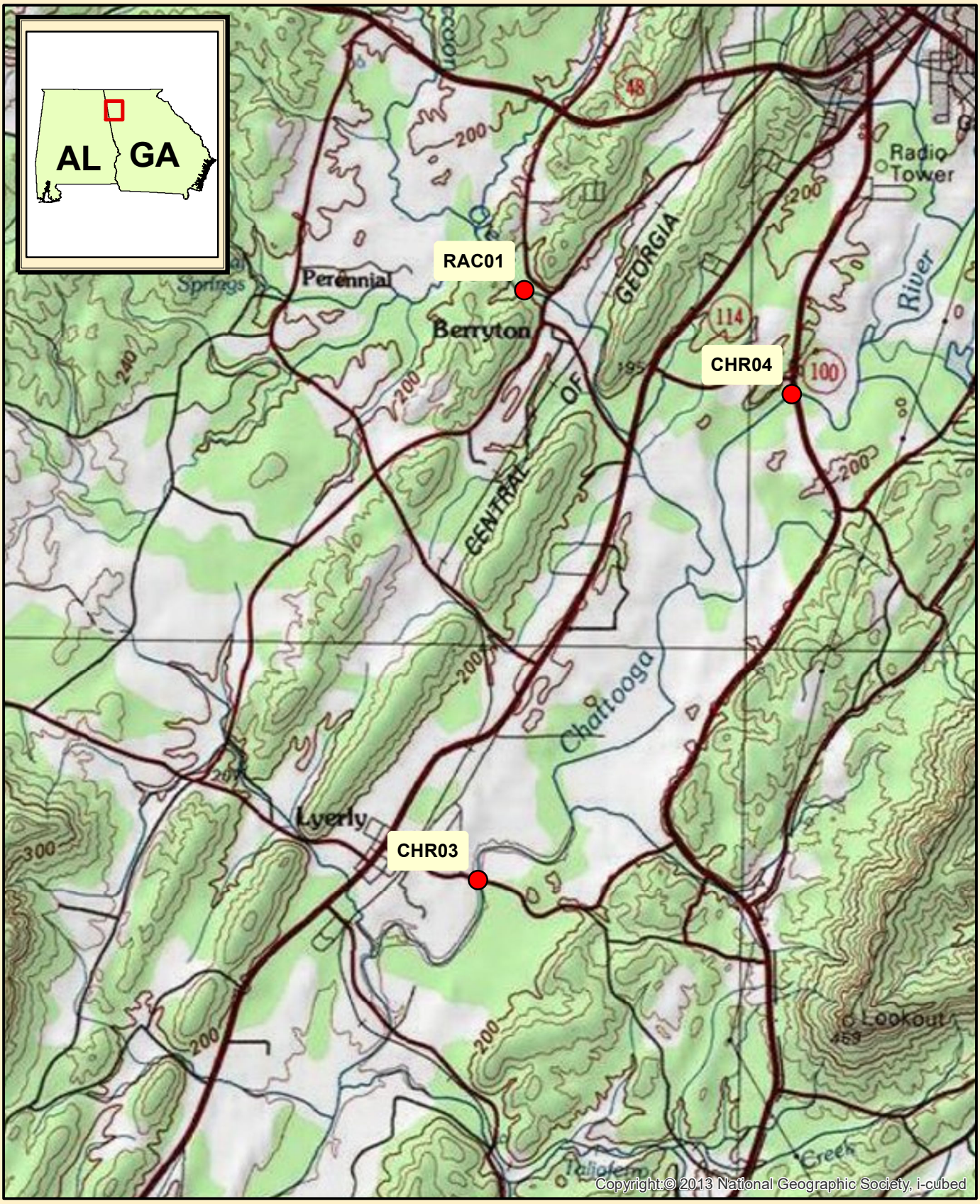


PFAS Screening:
Chattooga River (Base-flow)

Proposed Sampling Sites, November 2019

0 0.5 1 2
Miles

Sampling Locations

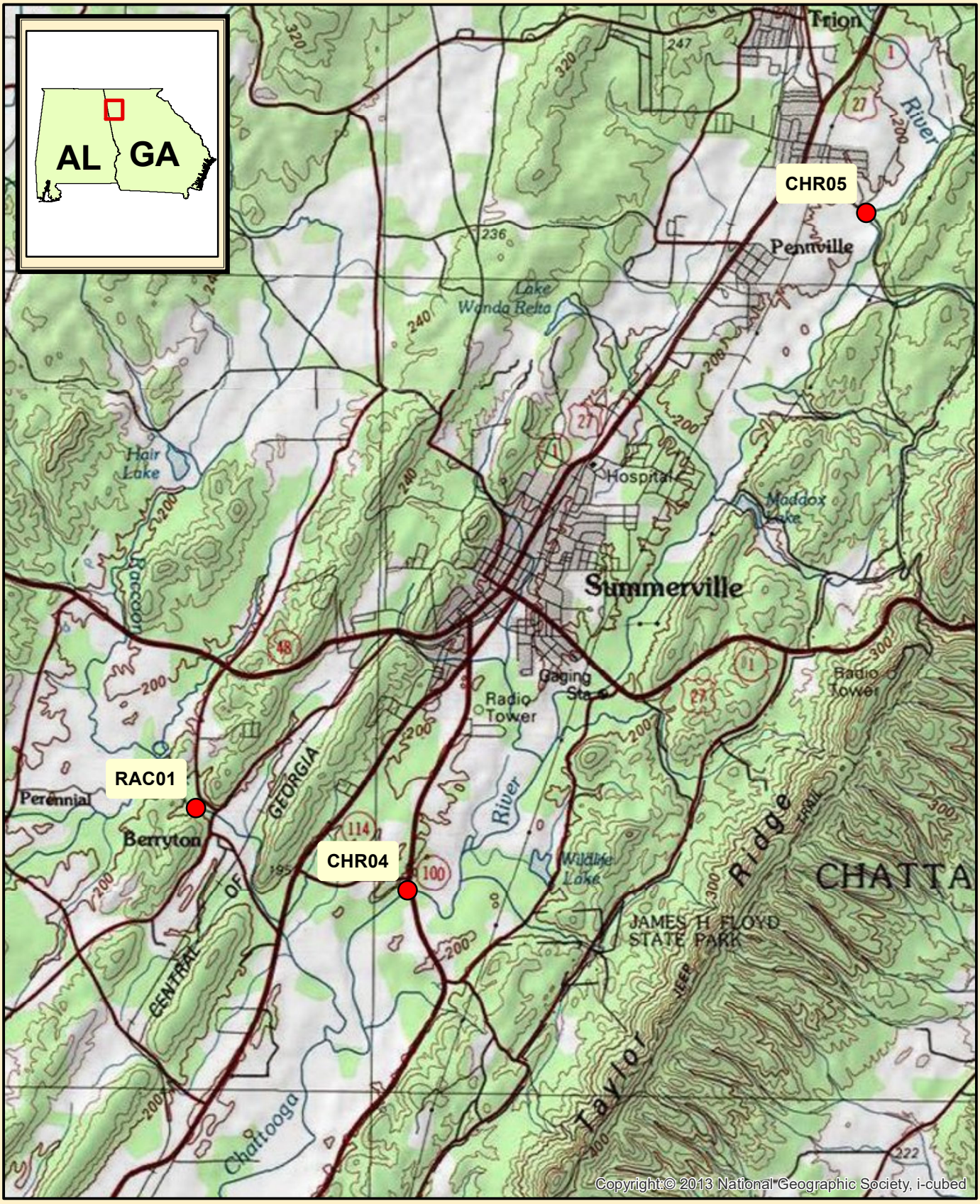


PFAS Screening:
Chattooga River (Base-flow)

Proposed Sampling Sites, November 2019

0 0.4 0.8 1.6
Miles

Sampling Locations

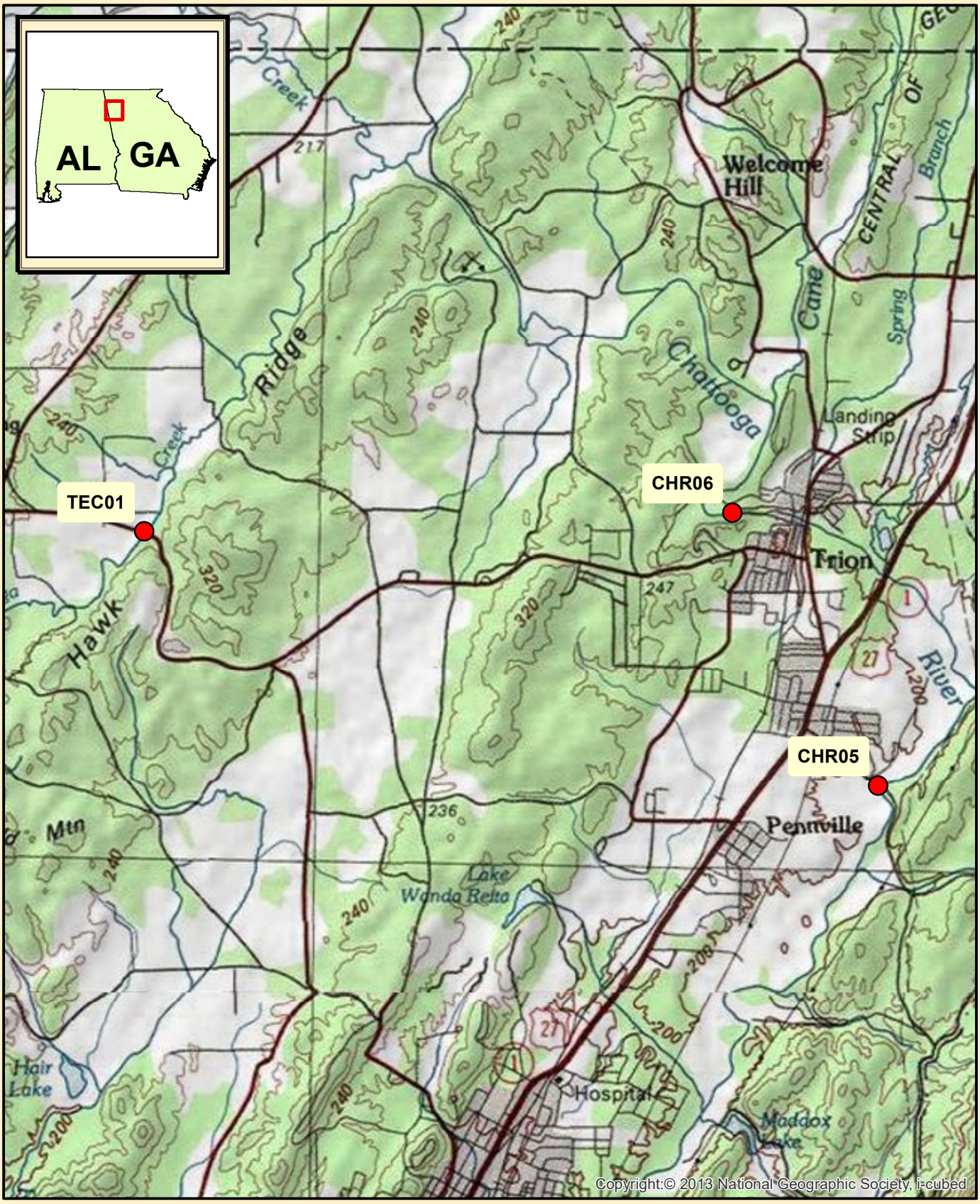


PFAS Screening:
Chattooga River (Base-flow)

Proposed Sampling Sites, November 2019

0 0.5 1 2 Miles

Sampling Locations

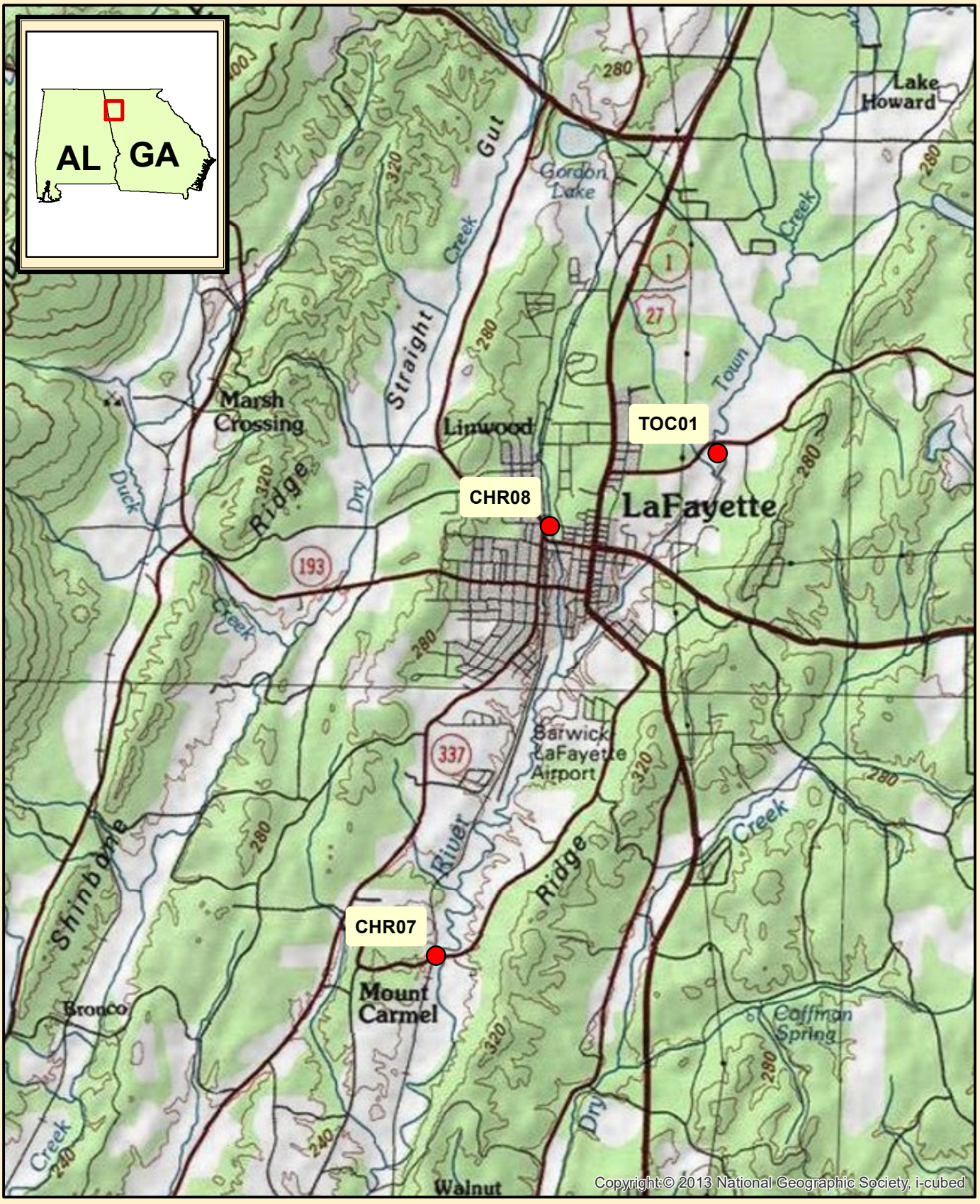


PFAS Screening:
Chattooga River (Base-flow)

Proposed Sampling Sites, November 2019

0 0.3 0.6 1.2 Miles

Sampling Locations



PFAS Screening:
Chattooga River (Base-flow)

Proposed Sampling Sites, November 2019

0 0.3 0.6 1.2 Miles

Sampling Locations